Unit 04: Water, Land and Air (Weeks 19-24)

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **FY**
Status: **Published**

Standards Alignment

New Jersey Student Learning Standards

SCI.HS-LS2	Ecosystems: Interactions, Energy, and Dynamics
SCI.HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
SCI.HS-ESS2-4	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
SCI.HS-ESS2-5	Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
SCI.HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
SCI.HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
SCI.HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity (i.e., climate change).
2-ESS2	Earth's Systems
3-ESS3	Earth and Human Activity

Integration of Career Readiness, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.

CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.A.2	Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
TECH.8.2.12	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.12.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.12.A.2	Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste.
TECH.8.2.12.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.
TECH.8.2.12.B.3	Analyze ethical and unethical practices around intellectual property rights as influenced by human wants and/or needs.
TECH.8.2.12.B.4	Investigate a technology used in a given period of history, e.g., stone age, industrial revolution or information age, and identify their impact and how they may have changed to meet human needs and wants.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.C.3	Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human factors engineering (ergonomics).

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math Section

	Key Ideas and Details
LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

	Integration of Knowledge and Ideas
LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
LA.RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
LA.K-12.NJSLSA.W	Writing
	Text Types and Purposes
LA.K-12.NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.K-12.NJSLSA.W2	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
LA.RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
LA.K-12.NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.W.11-12.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.W.11-12.1.C	Use transitions (e.g., words, phrases, clauses) to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
LA.W.11-12.1.E	Provide a concluding paragraph or section that supports the argument presented (e.g., articulating implications or the significance of the topic).
LA.W.11-12.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
LA.W.11-12.2.A	Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
LA.W.11-12.2.B	Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
LA.W.11-12.2.C	Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
LA.W.11-12.2.F	Provide a concluding paragraph or section that supports the argument presented (e.g., articulating implications or the significance of the topic).
LA.W.11-12.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale
Unit Rationale The purpose of this unit… **The purpose of this unit is to understand the importance and dependency on our natural resources like water, air and land and to analyze the negative impact caused by the human population**

Meaning

Essential Questions

Essential Questions

- **In what ways do we depend on water and what impacts have humans had on the limited water supply?**
- **What is the cause of air pollution, how does it affect our air quality and what are the long term/short term effects of the pollution?**
- **How have human activities affected Earth's climate?**

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

Students will understand that:

- **Only a small percentage of the available water is fresh, and misuse and pollution has caused this to be one of our most threatened resources**
- **Most air pollution is a result of human activity, however it can also come from natural sources**
- **Long term effects on health have been linked to air pollution; Americans pay tens of billions of dollars each year for health costs to treat diseases caused by air pollution.**
- **Scientists are contributing both the hole in the stratospheric ozone and global warming directly to the result of human activity**

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know…

- **Latitude and longitude can be used for location**
- **Earth is known as the blue planet because 71% of its land is covered in water**
- **Water comes in three forms; solid, liquid and gas**
- **The water cycle**
- **The water cycle is a continuous movement of water between Earth and its atmosphere**
- **Although 71% of the Earth is water, 97% of it is saltwater and contained in oceans and seas**
- **Out of the 3% of water that is freshwater, 77% of it is frozen and locked up in ice caps, so we only have a small portion of water that we all must depend on for survival**
- **Surface water is freshwater on Earth's land surface found in lakes, rivers, streams and wetlands, that we is depended on for freshwater supplies**
- **As streams and rivers move across the land, they form a flowing network of water called a river system**
- **The mississippi, amazon and nile river systems are the largest in the world**
- **The area of land that is drained by a river is known as a watershed**
- **Pollution anywhere in a watershed may end up polluting the river**
- **Water beneath the Earth's surface in sediment and rock formation is called groundwater**
- **When it rains, water percolates through the ground and soil and down into the rocks beneath**
- **An water An underground formation that contains groundwater is called an aquifer**
- **Groundwater can dissolve materials, such as limestone, and fill vast caves with water, creating underground lakes**
- **An area of the Earth's surface from which water percolates down into an aquifer is called a recharge zone**
- **Pollution in a recharge zone can enter an aquifer**
- **Because surface water can take a very long time to refill an aquifer, they can take tens of thousands of years to recharge**
- **The size and building structure can affect the permeability of the surface above the recharge zone and**

reduce the amount of water entering the aquifer

- A hole that is dug or drilled to reach groundwater is called a well
- Wells can dry up when the water table falls below the bottom of the well during a drought
- A shortage of fresh clean water (due to the increasing population) is one of the most pressing environmental issues; more than 1 billion people lack access to fresh, clean reliable source of water
- The three main uses for water are agricultural, industrial and residential
- The majority of the water supply is for agricultural purposes to irrigate crops
- In the US, more than half of residential water use is for activities outside the home, such as watering the lawn and pools
- Water must be treated in order for it to be potable, or drinkable, and remove elements such as mercury, lead and arsenic
- Treatment plant remove disease causing pathogens caused by feces and sewage by adding good bacteria, filtration, aeration, and chlorination
- Farmers are having to drill deeper and deeper in order to reach a fresh water supply, which is continuing to decrease our available water supply
- Desalination and water transportation are possible solutions for the future water crisis
- Individuals can make a difference by making choices that support water conservation
- Water pollution can be classified as either point pollution or nonpoint pollution
- Water pollutants include wastewater, eutrophication, thermal pollution, groundwater pollution, and ocean pollution
- The buildup of pollutants to higher levels in the food chain is called biomagnification; the use of DDT pesticide almost caused the extinction of the bald eagle population
- Federal laws have been enacted to protect our water supply from pollution and help to improve water quality
- When harmful substances build up in the air to unhealthy levels, the result is air pollution
- Air pollution is mostly a result of human activities, however it can also come from natural sources such as sulfur dioxide, dust, pollen and spores
- A pollutant put directly into the air from human activity is a primary pollutant, a secondary pollutant results from a primary pollutant reacting with another primary pollutant or a naturally occuring substance
- Household products, power plants and motor vehicles are sources of primary air pollutants
- Examples of primary pollutants include carbon monoxide, nitrogen oxide, sulfur dioxide, particulate matter and VOC's
- The world air quality problem is much worse today because modern industrial societies burn large amounts of fossil fuels
- ⅓ of our air pollution comes from vehicle emissions
- The clean air act (1990) gives the EPA the right to regulate vehicle emissions in the U.S,.
- When air pollution hangs over urban areas and reduces visibility, it is called smog
- Smog results from a chemical reaction between sunlight, air, automobile exhaust, and ozone
- The circulation of air in the atmosphere usually keeps air pollution from reaching dangerous levels
- When the warmer air above is traps the cooler air at the surface, preventing it from moving upward, a temperature inversion occurs and pollutants and cooler air are trapped in the city (occurs in Los Angeles frequently)
- Individuals that are very young, very old or who have heart and lung problems are most susceptible to air pollutants
- Short term effects of air pollution include nausea; headache; irritation to the eyes, nose and throat; tightness to the chest; upper respiratory infections and coughing
- Long term effects of air pollution include emphysema, lung cancer, and heart disease
- Exposure to indoor air pollutants, like radon gas and asbestos, may result in cancer
- When fossil fuels are burned, they release oxides, which combine with precipitation and result in acid rain
- Both plants and animals are negatively affected from an acidic environment
- Weather is the state of atmosphere at a particular place at a particular moment, while climate is the long-term prevailing weather conditions at a particular place based upon previous conditions

- **Climate is determined by latitude, altitude, atmospheric circulation patterns, oceanic circulations patterns, geography, solar activity, volcanic activity and distance from the equator (most influential)**
- **Cool air rises from the equator and travels towards both poles, making them cold desserts**
- **Ice cores indicate changes in the Earth's climate over time**
- **Prevailing winds blow in the same direction due to the rotation of the Earth; to the right in the northern hemisphere and to the left in the southern hemisphere**
- **El Nino is the name given to the short term periodic change in the location of the warm and cold water masses in the pacific ocean, causing the pacific to be warmer than normal**
- **La Nina is the name given to the short term periodic change when the pacific ocean is colder than normal**
- **Mountain ranges influence the distribution of precipitation, temperature falls by 6 degrees celcius every 1000 meters**
- **The tilt in the Earth's axis causes seasons in the northern and southern hemispheres to be different**
- **The ozone layer is an area in the stratosphere where ozone is highly concentration; it protects Earth from harmful UV rays emitted from the sun**
- **During the 1970's, the use of CFC's caused a large hole to form in the ozone layer above the south pole, which increased our exposure to UV light, making us more susceptible to skin cancer**
- **Greenhouse gases (carbon dioxide, water vapor, CFC's, methane and nitrous oxide) accumulate at the top of the troposphere and absorb heat and cause the greenhouse effect**
- **CO2 levels in the atmosphere have increased by over 20% in the last 50 years, mostly due to the burning of fossil fuels**
- **Greenhouse gases trap heat, therefore causing an increase in global temperature, known as global warming**
- **A warmer Earth could potentially cause melting ice caps, changes in weather patterns and a rise in sea levels**

Skills

Skills

Student will be skilled at …

- **Describe the distribution of Earth's water resources**
- **Explain why freshwater is one of Earth's limited resources**
- **Explain the each step of the water cycle**
- **Identify the relationship between groundwater and surface water**
- **Identify patterns of global water usage**
- **Explain how water is treated so that it can be used for drinking**
- **Describe how water is used in homes, industry and in agriculture**
- **Identify ways that water can be conserved**
- **Compare and contrast point-source pollution and nonpoint-source pollution**
- **Classify water pollutants by five types**
- **Explain why groundwater pollution is difficult to clean up**
- **Describe the major sources of ocean pollution**
- **Discuss the effects of pollution on ecosystems**
- **Identify six major laws designed to improve water quality in the United States**
- **Elaborate on the process of biomagnification and relate it to when the Bald Eagle population almost went extinct**
- **Determine how the bottled water companies retrieve their water and compare it to tap water**
- **Name five primary air pollutants and give a source for each**

- **Describe how smog forms**
- **Explain how thermal inversion traps air pollution**
- **Formulate a hypothesis as to why the world air-quality problem is much worse today as compared to the past**
- **Establish the relationship between the burning of fossil fuels and the increase of carbon dioxide production**
- **Describe how the clean air act has helped to improve air quality**
- **Identify both long term and short term effects of air pollution**
- **Identify sources of indoor air pollution, such as asbestos and radon gas**
- **Explain the cause of acid rain precipitation**
- **Explain how both salt and acid rain affects plants, soil and aquatic ecosystems**
- **Explain the difference between weather and climate**
- **Identify several factors that help contribute to climate**
- **Explain why different parts of Earth has different climates**
- **Describe what causes seasons**
- **Identify the difference between latitude and longitude**
- **Contrast between el nino and la nina**
- **Explain how the ozone layer shields the Earth from much of the sun's harmful UV radiation**
- **Describe the effect of CFC's on the ozone layer**
- **Predict the conditions on Earth without the ozone layer**
- **Describe the damaging effects of UV radiation**
- **Explain why the threat to the ozone layer still exists today**
- **Compare the Earth's atmosphere to the the glass in a greenhouse**
- **Explain why the amount of carbon dioxide in the atmosphere is increasing**
- **Identify the damaging effects of a warmer Earth**
- **Describe the process of global warming**

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

- **Powerpoint presentations**
- **Textbook Environmental Science (Holt)**
- **Scienceworld Magazines**
- **Articles related to topics**
- **Youtube videos**
- **Materials for labs**
- **Water Testing Kit**
- **Seed Germination Lab**
- **Global Warming Simulation Lab Materials**
- **Water Taste Test Materials**

- **Ozone Scientist Read and Discuss pg. 379**
- **Convection Currents Demonstration Materials**
- **Air pollution lab materials**

Formative Assessment Strategies

Formative Assessment Strategies

- **Quick Thoughts**
- **Exit Slips**
- **Kahoot**
- **Bingo**
- **White Board Participation**
- **Homework**
- **Teacher Check**
- **Thumbs up/thumbs down**
- **Create a Test/Take a Test**
- **Whole class questioning and answering**
- **Graphic Organizers**
- **Foldables**
- **Air Pollution Quiz**

Learning Activities/Unit of Study

Learning Activities/Unit of Study

- **Create the Water Cycle**
- **Seed Germination Lab: How salt and acid affect germination**
- **Water Testing in Newton Creek**
- **Water Taste Test: Can you tell the difference between different brands of water?**
- **Life without the Ozone Layer RACE prompt: one paragraph**
- **Where in the World? Plotting latitude and longitude**
- **Simulating Convection Currents (demonstration)**

- **Ice Cores: Reconstructing the past pg. 355**

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, GIfted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how

much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just

may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.